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ABSTRACT

Two intermediate elementary schools in the Bay Shore District of Bay Shore, New York, were studied to assess the impact upon student achievement of a program in cooperative learning applied to mathematics, reading, and writing. The schools include the Gardiner Manor and South Country Schools; in the 1986-87 school year, 510 students attended the former, and 449 attended the latter. Twenty-four third-, fourth-, and fifth-grade teachers and their classrooms participated in the study. Assessments were also made to determine the effects of such programming on students' attitudes, self-esteem, and gender and race relations. Demographic analyses were conducted. The study adopted a pre-test/post-test quasi-experimental design. Data collection instruments included the Iowa Tests of Basic Skills, Coopersmith Self-Esteem Inventory, a modified version of "Who Are Your Friends?", student writing samples, and various attitude inventories. Unlike previous studies, cooperative learning in this instance did not prove to be any more effective than traditional educational strategies in increasing students' achievement, enhancing race and gender relations, or improving youngsters' attitudes toward school. The complexity of the experimental design, its compressed nature, and the effectiveness of the existing traditional curriculum may explain this result. Positive gains found for Hispanic students should be investigated further. A 115-item reference list is presented. (TJH)

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A Study of Cooperative Learning in Mathematics, Writing and Reading as Implemented in Third, Fourth and Fifth Grade Classes: A Focus Upon Achievement, Attitudes and Self-esteem for Males, Females, Blacks, Hispanics and Anglos

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INTRODUCTION

This paper describes a study which sought to answer the following questions: Do cooperative learning methods have the effect of increasing students' achievement in reading, mathematics and writing when the cooperative structures are implemented simultaneously in all three of these academic areas in classroom settings? After implementing cooperative learning in these three subjects, will improvement be evidenced in self-esteem, gender and race relations, in students' attitudes toward one another and toward their academic subjects? Will results be comparable for girls and boys; for blacks, Hispanics and Anglos; and for high and low achieving students?

Hundreds of studies focusing upon cooperative learning have been conducted during the past decades. The period since 1930 is dotted with research, most of which can be categorized as "laboratory" studies. Although research based upon cooperation has been conducted for many years, research focusing upon the practical applications of cooperative learning did not begin until the 1970s (Slavin, 1981). Since that time there has been a plethora of research, field studies and laboratory studies focusing upon cooperative learning.

However, limited data exist which focus upon cooperative learning as implemented in several disciplines simultaneously. Therefore, this study provides a perspective not yet explored.

DESIGN AND IMPLEMENTATION

In order to answer the research questions, a quasi-experimental design was developed. The research investigated the implementation of cooperative learning in classes of third, fourth and fifth grades and examined the results of cooperative learning structures applied to mathematics, writing and reading. Results were analyzed for diverse racial groups and for both genders. Academic achievement, attitudes, friendship choices as well as self-esteem provided additional focus for analyses of the outcomes.

Site

Two intermediate schools in the Bay Shore School District in Bay Shore, New York, were selected for the study. The two elementary schools, Gardiner Manor and South Country Schools, are located within the residential community of Bay Shore which is a multi-ethnic, multi-racial suburban district located 45 miles east of New York City on the south shore of Long Island.

The district, which encompasses the Hamlet of Bay Shore and the unincorporated Village of Brightwaters reflects a composite of professional interests and commercial enterprises. Two large shopping malls, two hospitals, as well as smaller retail establishments are found within the Bay Shore boundaries.

The district includes seven schools: three primary schools, the two intermediate schools named, one middle school and one high school. The total student enrollment for the 1986-87 school year was 4,737 youngsters in the entire district. Of that number, 959 attended the two intermediate schools: Gardiner Manor at 510 students and South Country at 449 students.

The district population reflects a cross-section of racial and ethnic

representation. Of the student population during 1986-87, 71.9% were white, 17% were black, 9.4% were Hispanic and 1.8% were American Indian, Alaskan, Asian or Pacific Islander. Within the Gardiner Manor and South Country Schools, the divisions revealed the following: Gardiner Manor - 73% white, 17.4% black, 9.2% Hispanic and .5% American Indian, Alaskan, Asian or Pacific Islander. Within South Country School, the population was represented as follows: 69.7% white, 15.2% black, 13.2% Hispanic and 1.9% American Indian, Alaskan, Asian or Pacific Islander.

According to the 1980 census, the median household income was $19,989 with $23,714 as the median family income. The district represents a cross-section of those who were very wealthy to those who were low income. With a total population of 29,345 in 1979, Bay Shore included 2,727 residents, or 10.76 percent, who fell below the poverty level. Families earning upwards of $75,000 or more comprised 2.7% of the population; families earning between $50,000 and $74,999 reflected 7.6% of the population. Those families who averaged between $25,000 and $49,999 included 36.8% of the residents and those whose annual income yielded between $15,000 and $24,999 reflected 27.2% of the population. Thus, the community reflected and still reflects a diverse cross-section of socio-economic status.

As in most suburban communities on Long Island, Bay Shore's residents span the age range. The median age is 31 years old with 6% of the population younger than five years. The district residents who are between five and 15 years represent 15.2% of the population. Sixty-two and one half percent of the population range between 15 years and 59 years with 7.6% between 15 and 18 years old. The remaining 14.8% of the residents are 60 years old and older.

Additionally, a cross-section of occupations are represented in the District's employment statistics of the 1980 census report. In the labor force are 5,314 employed females and 7,386 employed males. Of that number, 25.9% are employed in managerial and professional occupations. Technical, sales and administrative support jobs provide work for 31.4% of the employed labor force. In service occupations, 13.7% of the population are found. Only 1.1% of the population are employed in farming, forestry or fishing positions, whereas 12.9% are employed in precision production and craft-related jobs. Operators, fabricators and laborers reflect 6.8% of the labor force.

Clearly the Bay Shore district as a whole represents diversity. The population reflects a multi-ethnic, multi-racial cross-section within its boundaries with a mixture of low- and high-income residents. The wealth of the community is as varied as its age range with children born each year and with octagenarians in the populace.

To examine the schools in the district, student achievement was considered. With respect to standardized test scores, the district is within the range of national norms (Bellamore, Best & Roelle, 1986). Although student achievement falls within the average range as assessed by standardized test measures, the district is recognized for achievements each year. For example, five members of the class of 1986 received recognition from the National Merit Scholarship Program. Other honors reflected the district's commitment to improving instruction and curriculum: In 1984 the district received State and national recognition for its writing curriculum; in 1985 the schools received a national commendation from the American Association for School Administrators for its staff development program; and in 1988 the district gained the

Exemplary Leadership Development Award from the American Association for School Administrators. Thus, whereas the students in the Bay Shore School District reflect national norms, there are numerous examples of exceptional achievement.

Sample

The Gardiner Manor and South Country intermediate schools in the Bay Shore District contain 39 third, fourth and fifth grade classes. Among the total, there are twelve third grade classes, seven in Gardiner Manor and five in South Country; fourteen fourth grade classes includes eight in Gardiner Manor and six in South Country; and of the thirteen fifth grade classes, seven are located in Gardiner Manor and six in South Country.

To conduct the research and investigate the effects of cooperative learning in three academic disciplines, a sample of teachers and their classes was needed. In order to obtain the sample, the Bay Shore School District was amenable to the project to the degree that volunteers could be invited to join the research investigation and that no teacher would be required or mandated to participate. Thus, a volunteer sample of teachers could be drawn. At the outset of the study, there were nine teachers in the third, fourth and fifth grades. Each classroom teacher was asked to become part of the research project and twenty four teachers or 62% agreed to participate.

Admittedly there are potential hazards in using a volunteer rather than a random sample. However, despite those drawbacks, two significant gains may be achieved by using volunteers rather than by mandating participation: teachers who requested involvement in the project may have had a greater degree of ownership in the research than if they had been assigned to the study. Thus there may have been a greater likelihood that the volunteer sample would have

complied with the requirements and mandates of the research. Additionally, volunteers may have been more likely than assigned teachers to have completed the project and to have continued their involvement throughout the duration of the study. As a precaution very limited information relative to the study was disseminated in advance of the research so as not to bias the potential sample.

Since treatment as well as control group teachers were randomly chosen from among the same group of volunteers, the two groups can be considered equal in their willingness to use cooperative learning. The only drawback in using volunteers was that the study results can only be generalized to situations in which teachers agree to use cooperative learning techniques.

According to Borg and Gall (1983), "[f]or educational studies that employ other methods than survey, such as correlational or experimental research, the demands on the subjects are usually much greater, and consequently it is virtually impossible to obtain the cooperation of all subjects selected by random sampling" (p. 251). "[N]early all educational research must be conducted with volunteer subjects" (Borg & Gall, 1983, p. 251) and thus is the case for the study described herein.

Ultimately, 24 third, fourth and fifth grade teachers agreed to take part in the research to determine the effects of cooperative learning in their classrooms. Once the 24 volunteer teachers were included in the study, they and their intact classes were stratified by grade and randomly assigned to treatment and control groups.

Design

To examine the effects of implementing cooperative learning in mathematics, reading and writing, a pretest-posttest quasi-experimental design

was developed. Once teachers had committed themselves to participate in the research, they and their classes were randomly assigned to treatment or control groups.

Prior to random assignment, classes were stratified by grade level and paired according to academic achievement. The Iowa Tests of Basic Skills (ITBS), administered in the spring of 1986, were used as pretest measures of student achievement.

To determine similarities between classes, frequency distributions based upon normal curve equivalents for reading and mathematics were established. That is, based upon results on the ITBS, student scores in each class were rank-ordered from highest to lowest. For each class, the number of students scoring in each of the following categories were identified: 80-100 Normal Curve Equivalent (NCE), 40-79 NCE and 0-39 NCE. Frequency distributions for each set were determined in order to establish likenesses between classes.

With this method, classes with a preponderance of high achieving students were paired together and classes with a preponderance of low achieving students were matched prior to random assignment. This procedure ensured that similar classes had an equal opportunity to be placed in the treatment or control group.

To begin, classes were stratified by grade level first and then examined within buildings. Thus, for example, similar third grade classes within Gardiner Manor School were paired and randomly assigned to control or experimental groups. Fourth grade classes that were similar to one another at South Country School were matched and assigned to control or treatment groups. The same procedure was applied to fifth grade classes in Gardiner Manor and

South Country respectively.

In cases in which grade level classes within buildings did not match up based upon achievement on the ITBS, same grade level classes were paired between buildings. Thus one fourth grade class at Gardiner Manor School was matched with one fourth grade class at South Country School prior to random assignment.

In summary, the pretests for reading and mathematics, the Iowa Tests of Basic Skills (ITBS), were administered in advance of assigning classes to the experimental or control groups. Thus data for each class was available for examination prior to determining which classrooms received the treatment. With pretest data available, the pre-experiment profiles of all of the individual classes were compared to determine which groups were similar to one another. Classes were matched based upon their pretest scores on the ITBS and then randomly assigned to control and treatment groups.

Classes assigned to the control group continued to implement instruction in reading, writing and mathematics in traditional fashion without cooperative learning groups. Classes randomly assigned to the treatment group received training and instruction in reading, writing and mathematics using cooperative learning team arrangements.

Prior to the treatments group's implementation of cooperative learning in the three subject areas, teachers were trained by a team from Johns Hopkins University to use cooperative learning in each of the three academic disciplines. The implementation was monitored on a scheduled basis by a teacher trainer from Johns Hopkins and by a team from the Bay Shore School District.

To determine the effects of cooperative learning, classes in the experimental group were compared to those in the control group with respect to achievement, self-esteem and friendship choices. With respect to achievement, two of the dependent variables were achievement in mathematics and reading and were measured by the Iowa Tests of Basic Skills. The Iowa Tests of Basic Skills (ITBS) were administered as a pretest during the district's regularly scheduled testing program. As a pretest, the ITBS had been given in the spring preceding the study and were administered as a posttest in May at the conclusion of the research.

With respect to self-esteem, attitudes and friendship choices, the Coopersmith Self-esteem Inventory and a modification of "Who Are Your Friends"? were used. Both were administered as pretests prior to the implementation of cooperative learning and were re-administered as posttests at the conclusion of the study.

Achievement in writing was measured by scores attained on a writing sample obtained from both the control and experimental groups. For the pretest measure, the writing sample was administered to students immediately preceding the introduction of the treatment for cooperative learning in writing. The posttest in writing was collected from classes in the spring, at the conclusion of the study.

Both the pretest and posttest in writing were scored by a team of experts from Johns Hopkins University who were unaware of the student treatment assignments. An analytic scoring system produced ratings of ideas, organization and mechanics for each writing sample. Reliability checks were conducted to ensure the comparability of scorers' ratings.

While students in the control group classes received instruction in mathematics, reading and writing in traditional fashion, the experimental classes phased in the cooperative learning models for each subject area on a defined timetable. An eleven week period encompassed the training process and implementation for mathematics, writing and reading.

The schedule presented in Table 1 outlines the timetable for pretests, training, implementation and posttests. The weeks refer to the week numbers of the school year calendar.

As a summary, the following list of data collection devices provides an overview: Iowa Tests of Basic Skills used to assess students' achievement in mathematics, reading and language; writing probe used to assess students' written accomplishments relative to ideas, organization and mechanics; Coopersmith Selfesteem Inventory designed to evaluate students' selfconcept; subject inventory utilized to determine students' attitudes toward their subjects and their perceived abilities; and finally friendship choices used to identify the number, gender and race of students' friendship choices.

Treatment

General Training for Treatment

Prior to assigning classes to either the control or treatment group, all teachers were assured of receiving training in the cooperative learning methodology. The teachers in the treatment group were trained during the year of the study whereas teachers in the control group who so desired were able to receive training during the following year.

Once classes were randomly assigned, the treatment group teachers received training in cooperative learning methods in three subject areas: mathematics,

Table 1

Time table for Pre- and Posttests, Training and Implementation

School Calendar Week Numbers							
9	10	12	13	20	21	29	33
27-31 October	3-7 November	17-21 November	24 November	12-16 January	20 January	27 April-1 May	1-12 June
Introduction to the Study Training: Mathematics	Pretests: Writing Samples Coopersmith Self-esteem Inventory Who are your friends? Introduction of Treatment: Implementation: Cooperative Learning in Mathematics	Training: Writing	Implementation: Cooperative Learning for Writing	Training: Reading	Implementation: Cooperative Learning for Reading	Posttests: ITBS	Posttests: Writing Sample Coopersmith Self-esteem Inventory Who are your friends?

writing and reading. These three disciplines were basic to the curriculum in both of the intermediate schools in the study. Instruction in each area was integral to students' daily and weekly programs.

The reading and mathematics programs used in the third, fourth and fifth grades in the Bay Shore School District involved the Harcourt, Brace and Jovanovich Bookmark Program for reading and the Holt Series for mathematics. Materials from both programs were adapted for those teachers in the treatment group. Thus the curricula in reading and mathematics for both the control and treatment group classes were based upon similar texts and materials.

The district's writing program, based upon a process approach to composing, was incorporated into the cooperative learning instruction in writing. The actual training in the methodology of cooperative learning was conducted by a team from Johns Hopkins University and included Dr. Robert E. Slavin, Dr. Robert J. Stevens and Ms. Anna Marie Farnish.

Training in cooperative learning strategies for mathematics included one and one half days. For reading and writing, one full day was provided for each subject. Follow-up for each subject area was conducted by Anna Marie Farnish during her scheduled visits to the Bay Shore School District. The training process extended over an eleven week period. Once trained in each discipline, teachers were instructed to phase in the cooperative learning techniques in each academic subject area, including mathematics, writing and reading.

The mathematics training occurred first and thus the implementation of cooperative learning methods in math introduced students to the techniques and strategies. Once the teachers had received training, a team of five individuals continued to observe and monitor the implementation of the

cooperative learning instruction in classrooms. This monitoring team included a staff member from Johns Hopkins University, the two intermediate principals, the Coordinator for Testing and this researcher. This support team ensured that the methods and strategies of using cooperative learning were implemented correctly within each experimental group classroom.

After a three week period during which time the math program was implemented, the teachers then received training in cooperative learning strategies for writing from Ms. Anna Marie Farnish. Again, the process of training, implementation and follow-up support for teachers was similar to that of mathematics.

Following the teacher training in writing strategies, classroom teachers had the opportunity to implement cooperative learning methods in both math and writing. The students themselves had the chance to achieve in two academic disciplines using cooperative learning strategies.

After the writing program had been conducted for eight weeks and thus the math for eleven weeks, the reading component was introduced. Dr. Robert J. Stevens and Ms. Anna Marie Farnish provided the training in reading.

Whereas the practical components of each training program differed from discipline to discipline, the general procedure for each academic subject remained the same: teacher training provided by Johns Hopkins staff members, implementation of cooperative learning methodologies in classrooms, student involvement and follow-up support.

Throughout the training of the experimental group teachers and throughout the entire implementation of the cooperative learning program, control teachers continued to use their traditional instructional methods and curricular

approaches. A description of their classroom instruction follows later in the chapter. In general, control classes conducted three reading groups, had students working on individual activities as follow-up, conducted grade level instruction in math for all students, individualized seatwork, and used traditional language arts writing instruction for the whole class.

The next section of this paper outlines in greater detail the specific elements of the training and treatment. Detailed descriptions of the programs in mathematics, writing and reading follow.

Mathematics

The cooperative learning program in mathematics was modeled after the Student Teams Achievement Divisions (STAD) developed wa DeVries et al. (1980). Using this approach students worked in heterogeneous groups of males and females, mixed ability levels and mixed racial and ethnic backgrounds. For this study, the Holt Mathematics Program was used as the foundation for curriculum of the cooperative learning strategies.

Students received initial instruction by the teacher and then were given math problems to reinforce the lesson. Following such instruction, students checked answers with their team partners and reached group consensus. Following the partner checking, team consensus and teacher monitoring, students took tests on the material.

Each student received an individual score which was recorded. In addition, every youngster received a score based upon a comparison to the student's original average, or base score. Thus, each student was able to accrue points for his/her team based upon individual improvement. As a result, the less able math student had the same opportunity to attain points for the

team as the outstanding math student: both youngsters needed to improve their individual test scores in order to assist their teams. The training process as well as a more detailed description of the treatment in mathematics follow.

Training for Mathematics

To prepare for the implementation of the treatment in cooperative learning in mathematics, a staff development trainer from the Johns Hopkins University provided a one and one-half day program. The training consisted of a general overview of cooperative learning, specific information pertaining to cooperative learning in mathematics, a simulation activity in which participants mastered new material in adult learning groups and finally explanations of the tasks necessary to implement cooperative learning with students. The description of tasks for students included the following four activities.

Assigning students to teams.

The teacher-trainer described how student learning teams were to be formed. Four or five member groups were to include a cross-section of ability, race, gender and ethnicity.

Ranking students.

Prior to forming teams, students needed to be evaluated based upon their past performance. A system of ranking students in each class from highest to lowest achievers enabled teachers to develop learning teams that represented cross-sections of achievement levels.

Making copies of team summary sheets.

The staff development leader explained how students' individual scores were to be recorded and how team summary sheets were to be developed. A system

of reporting scores and maintaining records was outlined.

Deciding upon the number of teams.

Teachers learned how to determine the number of teams needed in each class. This decision represented a very clear technique of dividing the number of students in the class by four. Despite the simplicity of this task, it is important to note that this task as well as all steps along the way were addressed via the training process.

Format for Treatment in Mathematics

As indicated, the treatment of cooperative learning for mathematics followed the format of Student Teams - Achievement Divisions (STAD). Again, the cooperative learning techniques were implemented using as a foundation the Bay Shore School District's adopted curriculum in mathematics, the Holt Mathematics Series.

For the treatment, five major components comprised STAD: teacher presentation to whole class, student teams, individual quizzes, individual improvement scores and team recognition. Each of these components is described below:

Teacher presentations.

Initially, the teachers introduced new concepts and new learning to the entire class. Direct instruction, modified lectures, discussions and audio-visual presentations were used. Students attended to the teacher presentations since their quiz scores and their team scores depended upon mastery of teacher lessons.

Student learning teams.

The student learning teams and team concept provided the most significant

elements of the treatment in mathematics. After the teacher presentation, teammates assisted one another in mastering the material. Students checked one another's answers and were essentially responsible for one another's learning.

The team structure signaled an important component of STAD. Teams were comprised of four-member groups representing a cross-section of abilities, genders and races. High, medium and low achieving students, boys and girls, and blacks, Anglos and Hispanic students were balanced in each group. Teams were reconstituted every four-six weeks to engage each student with a wide range of peers.

Individual quizzes.

After students participated in guided practice and mastered the content of each lesson, youngsters took individual quizzes which ensured individual accountability. Each student attained an individual score which represented an attempt to improve over his/her last efforts.

Individual improvement scores.

Based upon improvement and a system of determining "improvement points," students contributed points to the team. Thus every student had an equal chance to assist his/her team regardless of the initial ability of the student. Each student reached for individual goals which were designed to surpass the performance achieved on the last test. Improvement over past performance provided the general objective.

Team recognition.

With students contributing points to their teams, the individual teams hoped to achieve recognition. Teams whose member raised their scores beyond levels of previous attainment received points. As teams accrued these points,

they received attractive certificates, teacher praise and class recognition. As students grew more and more comfortable with cooperative learning in mathematics, they became ready to transfer the techniques into the two additional academic disciplines: reading and writing.

Overview of Reading and Writing

The cooperative learning program in reading and writing was modeled after the Cooperative Integrated Reading and Composition (CIRC) developed by Madden, Stevens, Slavin and Farnish (1987). In the program, students worked in heterogeneous learning teams for reading and writing activities.

In reading, pupils received initial instruction in vocabulary from their classroom teachers. Following the instruction, students worked with partners during follow-up times on vocabulary, partner reading, decoding, spelling practice, story grammar, story summary activities and prediction - all of which were based upon basal stories from the Harcourt, Brace and Jovanovich reading series.

Even though the cooperative learning model was used, students had been assigned to reading groups based upon their prior achievement. Their cooperative learning group assignment was determined by their classroom teachers. First, partners were assigned to one another based upon pairing students from identical reading groups. Then, team were developed by combining two sets of partners from two distinct reading groups. Thus in every team of four students, two reading groups were represented.

Students worked in teams on structured reading comprehension and language arts activities as well as engaged in peer editing and writing. All reading and writing activities followed a prescribed cycle that involved teacher

presentation, team practice, peer pre-assessment, supplementary practice, evaluation and reinforcement for achievement. What follows first is a more detailed explanation of the writing component. The treatment in writing was implemented three weeks after cooperative learning in mathematics. After the outline of the writing program appears in the following section, the specifics of the reading treatment proceeds.

Writing

In addition to cooperative learning teams for mathematics, three weeks later students participated in cooperative learning groups for writing. The element of cooperative learning stressed in the writing treatment focused upon direct instruction by the teachers, student learning teams and writing in the classroom. The latter two elements characterized the essence of the cooperative learning program in writing.

Training for writing.

The staff development training focusing upon cooperative learning in writing consisted of a full day, seven and one half hour workshop. Recalling the initial training in cooperative learning for math, the teachers launched directly into the writing rather than upon general rules for cooperative learning. Teachers had already learned how to group students, how to create an atmosphere of cooperation and how to reward students.

To begin the session on writing, 13 third, fourth and fifth grade teachers in the experimental group attended an initial presentation conducted by the same teacher-trainer from Johns Hopkins University who had conducted the program in mathematics. The staff development trainer shared an overview of the entire writing process which was familiar to the Bay Shore teachers. The

District's own writing curriculum provided the basis for its extension into cooperative learning.

The reinforcement of the writing process focused upon components such as pre-writing, composing, revising and editing. With the overview, classroom teachers connected the elements of the writing process to the framework of cooperative learning.

During the staff development session, all teachers participated in simulations of the elements of the treatment in writing. Teachers moved through the writing process with an exercise in composing. Following that, teachers shared their writing in small groups to give and receive feedback. "Rewards" were conferred upon teams that completed assigned tasks. In essence, teachers engaged in the same activities which they would then teach to their students. The following section highlights the components of the treatment in writing: direct instruction, student learning teams and writing in the classroom.

Treatment for writing: Direct instruction.

In the cooperative learning program teachers provided direct instruction on strategies for writing such as creating detail, developing ideas and organizing essays. Then students wrote original papers based upon the teacher's introduction of new learning. The cooperative learning component focused upon students helping one another at specific points in the writing process, responding to and evaluating one another's writing.

Treatment for writing: Student learning teams.

Partner and team consensus provided direction for the development of students' writing. Students shared their writing and read papers to one

another. Then within teams, students revised and edited their work. Student teams accrued points, received recognition and amassed certificates based upon accomplishment of writing assignments.

Treatment for writing: Writing in the classroom.

Within teams, peers maximized one another's opportunities to reflect upon their writing, to give feedback and to receive responses. As students received feedback from teammates, they learned to what extent their message was being communicated to their peer audience. Students focused upon what constituted good writing, what captured their audience's interest, what techniques communicated good organization and what techniques culminated in appropriate understanding of the writing. In order to evidence success in the cooperative learning writing groups, students worked together, read their writing to teammates, gave helpful feedback to one another, used editing forms correctly and supported one another in their efforts to succeed.

The stages implicit in the entire writing process included pre-writing, drafting, eliciting responses from teammates, revising, editing and publishing. Using the District's writing program as the basis, teachers incorporated cooperative learning strategies in their classes with their students.

In the treatment group classrooms, teachers maintained a supportive writing atmosphere, guided students through steps in the writing process, modeled positive responses to writing, monitored individual and team progress, circulated among teams, provided praise for writing as well as praise for teamwork, reviewed completed work and forms, conferred points upon teams and facilitated sharing of writing. Having mastered the strategies of cooperative learning in writing, students and teachers became ready to launch into

cooperative learning for reading.

Reading

The reading training for teachers in the experimental group occurred during one full day. A member of the Johns Hopkins University staff who had helped develop Cooperative Integrated Reading and Composition (CIRC) conducted the training.

Training for reading.

During the training process, teachers were inserviced in new methods to develop teams within their classes as well as additional teaching strategies used for cooperative learning in reading. The training program consisted of several experiential activities which ultimately were implemented with students.

To begin, the staff development trainer and developer of CIRC, Dr. Robert J. Stevens, introduced the teachers to a story as if experimental group teachers were students in a cooperative learning classroom. Dr. Stevens shared ostensibly new vocabulary words, asked participants to pronounce words aloud and to hypothesize about their meanings. Additionally, based upon vocabulary, teachers predicted the plot line and theme of the yet unread story.

Next teachers silently read half way through the short piece of fiction and conjectured as to the story's conclusion. Pairs of teachers came together to share hypotheses and to practice reading aloud. Each teacher alternated oral reading with a partner by reading every other paragraph aloud. Targeted goals included improving fluency and comprehension.

By the end of the training session, teachers had engaged in every activity of the cooperative learning treatment in reading which they would ultimately

share with their students. Through several simulations and experiential tasks, teachers learned the strategies necessary to implement cooperative learning in reading within their classrooms.

Treatment for reading.

The reading treatment for the cooperative learning classes focused upon the following three general components: direct teacher instruction in reading comprehension, basal-related activities and an integrated approach to reading and writing. In each area of reading, students worked in heterogeneous groups to achieve mastery. The sequence of events for each reading unit followed a prescribed pattern: presentation by the teacher, practice within student learning teams, pre-assessment by peers, additional practice as needed and final testing. In order to implement the cooperative learning treatment in reading, students needed to be assigned to appropriate learning teams.

Student learning teams.

Prior to the introduction of cooperative learning, students had been placed in reading groups based upon their reading level. Generally three reading groups occupied each class. The basic text for Bay Shore's reading program included the basal series published by Harcourt, Brace and Jovanovich (HBJ). Thus in any one given class, three sets of students read from separate basals (HBJ).

In order to facilitate a cooperative learning arrangement and group students of mixed ability levels, the following techniques worked toward that end. Within each existing reading group, the teacher devised partnerships. Thus every student was assigned a "buddy" within her/his reading group. Following that, each set of pairs were placed within a student learning team

consisting of four students. Thus two sets of partners comprised a given team. In this fashion, a student team often included two youngsters from the highest reading group and two students from the lowest reading group. Additionally, some groups contained two students from the middle group and two from the top; other groups contained a pair from the middle and a partnership from the bottom reading group.

As in the cooperative learning treatment in mathematics and writing, students were accountable not only for their own learning but also responsible for the achievement of their teammates. In reading, if students mastered objectives, they accrued individual points which assisted their team.

All students contributed to their team's scores through achievement on quizzes and through writing activities based upon their reading. Students' individual points combined to form a team composite. Low achieving as well as high achieving students had equal chances to contribute points to the team score. Recognition and incentive took the form of attractive certificates awarded to high achieving teams.

Basal related activities.

Students used their regular HBJ basal readers as their teachers introduced stories and led the initial stages of the reading groups. The experimental group teachers were trained to provide a highly structured approach for the cooperative learning strategies.

The teachers learned to use a procedure to introduce new vocabulary, review familiar vocabulary, set a purpose for reading, discuss the stories with a focus upon story grammar and enable students to make and support predictions.

After students worked with the teacher in the respective reading groups,

students received activities to be conducted in the learning teams. As students completed each component listed below, their partner(s) checked their work and assumed responsibility for teammates' learning by initialing the individual student's assignment form.

Partner reading.

Initially, each student read each story silently. Then in pairs based upon like reading groups, students read aloud each story by alternating paragraphs. Thus each child read aloud 50% of each piece.

Story structure.

Students focused their thinking about the story upon the story grammar. After reading half the story, students were asked to describe the setting, characters, plot as well as to identify the conflict. Then students were asked to predict: How would the conflict resolve itself?

Words out loud.

Students needed to be familiar with difficult and new vocabulary. Thus they were taught to practice saying these words aloud and reading them accurately to their partners.

Word meaning.

Students were taught the nature of writing sentences which reflected a vocabulary word's specific meaning. Writing "meaningful" sentences became a component of the program.

Story retell.

Students paraphrased the story in their own words and shared the chronology, events and main points with their partners. Sharing the story with peers occurred for each piece of assigned literature.

Spelling.

Each week students mastered spelling words. Using pretests followed by peer assessments, students proceeded to individual testing at the end of each week.

Summation.

After the completion of the above-listed activities and after extensive partner checking, each student became accountable for her/his independent learning. Students received tests which included comprehension questions, meaningful sentences as well as words to be read aloud. These individual test scores contributed to the weekly team scores for which awards (certificates) were given. The cooperative spirit and the cooperative learning structure ensued in reading as it had in mathematics and writing.

Student Teams

Team assignments varied somewhat between the initial group developed for mathematics and writing and the later grouping structure which included reading. In mathematics and writing, groups were comprised heterogeneously without regard to reading levels. Teams were composed with high, middle and low ability students; with multi-reading groups; with boys and girls; and with youngsters from diverse racial and ethnic groups. With the introduction of the treatment in reading, teams consisted of two sets of partners from two designated reading groups. As stated, some teams included two students from the lowest reading group and two from the middle group; some groups included from the highest and two from the lowest reading group. Thus despite a minor variation in team development, all groups reflected a cross-section of race, ethnicity, gender and achievement.

Based upon students' individual performance, points were accrued and individuals contributed points to form team scores. Teams were awarded "Super Team" and "Great Team" designations as they met criterion scores on all activities in a given weekly period. Certificates and recognition were awarded as reinforcement.

Control Group

Control group teachers continued to use their usual methods for mathematics, reading and writing. These methods included whole group instruction, individualized seatwork as well as student groups on tasks. In general, whole class direct instruction enabled the teacher to disseminate the same information to all students, monitor and adjust the lesson as appropriate to the group and provide guided practice activities structured so that students could attain an appropriate level of mastery.

Teachers also employed small group work in their classes. Groups were often comprised of students of similar ability, race and gender. Close friends often worked together in clusters to complete the teacher-directed assignments.

It is important to note that the model for group work bore little resemblance to models for cooperative learning. Students were not required to assist one another, question one another nor ensure that each child mastered the material at hand. Neither the teacher nor classmates proferred recognition upon student groups. In essence, what mattered in each group was that the "group" completed the assignment. In reality, that often translated into the following scenario: one member finished the task and shared the outcome with his/her peers.

In control group classes there were no implicit systems to ensure that

each student worked up to his or her ability level nor attained an appropriate level of mastery. In general, control group teachers employed a variety of teaching techniques and instructional methods. However, none utilized the highly structured methods of cooperative learning implemented by the experimental group teachers.

Mathematics

For teaching mathematics, classroom teachers in the control group based lessons primarily upon whole class instructional techniques. The District-adopted mathematics curriculum embraced the Holt mathematics series for the text component. Thus teachers integrated the Holt mathematics program into their daily lessons. After direct instruction of new concepts, control group teachers generally asked students to practice the new learning at their seats. The classroom teachers walked about the room to monitor the guided practice. Occasionally students worked together to solve problems and complete assignments. However, once again, the group work did not resemble the highly structured cooperative teamwork of treatment group classes.

Interestingly, two control group teachers professed to be employing cooperative learning in mathematics. The scenario they described which was confirmed upon observation consisted of the following: the teachers provided initial instruction in long division, a topic of new learning. Following the introduction of the new concept, the teachers led the class in a competitive event. Students competed against one another to obtain answers to problems more rapidly and accurately than other students. The winners of the competitions received as a reward the opportunity to become peer tutors in a neighboring class.

Clearly, despite the claims of these control group teachers, their instructional strategies and classroom activities did not resemble those of the cooperative learning teachers. In some cases, peer tutoring can in fact be a component of cooperative learning. However, neither the genesis nor the structure of the peer tutoring evidenced by these control group classes supported the view that cooperative learning was implemented on a regular basis.

In general, relative to mathematics, students were accountable for their own learning. Direct teacher instruction, guided practice, competition, as well as unstructured group work appeared in control group classrooms. Individual tests were administered by teachers periodically without the rigid testing schedule implemented in cooperative learning classrooms.

Writing

In writing, control group teachers based lessons and instruction upon the District-adopted process approach to writing. Teachers guided students through the stages of pre-writing, drafting, revising and editing.

Occasionally teachers would provide the forum for students to share their writing with peers in the classroom as a whole, in small groups or pairs. The sharing method, while cooperative in appearance, did not reflect the significant components revealed in treatment group classes. Whereas treatment group classes engaged in extensive peer feedback, control group classes did not. Whereas treatment class writing sessions promoted partner checks and group consensus, control class writing groups did not. In experimental group classes teachers conferred rewards upon successful teams, whereas teachers in control group classes did not. If accolades were in order, control group

teachers awarded individual students for individual successes. Thus significant differences appeared for writing instruction in control and experimental group classes.

Reading

For instruction in reading, control group teachers based their program upon the reading group model and used the Harcourt, Brace, Jovanovich series as the basis for basal readings. With generally three reading groups in a class, the teacher worked with a single basal-based group while the other two sets of youngsters worked independently at their seats engaged in individual seatwork. Oftentimes, the seatwork focused upon completing worksheets and xeroxed exercises. The worksheets included publisher-developed materials as well as teacher-prepared lessons.

Teachers in the control group structured the independent seatwork so that the students were technically isolated from one another. Students worked alone rather than in cooperation with other youngsters.

Upon occasion, control group classrooms revealed two or three students working together on an assignment. However, the structure of the collaborations were not premised upon any of the cooperative learning models figured in the literature nor upon the models evidenced in treatment group classes.

Thus with respect to general instructional strategies, control group classrooms operated differently from treatment group classes. In mathematics, writing as well as reading, teacher-directed instruction, group work and reward systems differed considerably between the control and experimental groups.

Administrative Support

The initial interest in conducting the study in cooperative learning as well as the imprimatur to initiate the research began with the Bay Shore School District's administration. Inviting the researchers, arranging meetings, coordinating training sessions for experimental group teachers, monitoring the implementation of cooperative learning and gathering feedback all rested with the District's administrative team. The most significant components of the administrative support which enabled the research to proceed as a successful study included the following:

Commitment from the District

Beginning with the Superintendent of Schools, the administration was visibly committed to the research and teacher support. The Superintendent of Schools as well as the Assistant Superintendent for Instruction, the Board of Education, two intermediate principals and two district coordinators provided the essential support for the program.

Confidence in the Profession

The administrators believed that a group of well-informed professional educators wanted to examine ways in which the Bay Shore School District could improve. The administrative team assumed the responsibility for keeping the teachers well informed. The confidence was confirmed: with the project, 62% of the eligible teachers volunteered to participate.

Awareness

The District administrative team assumed the responsibility of disseminating information. Teachers were apprised of the data pertaining to student achievement and continually informed of updates on the project.

Curriculum Modification

Rather than accepting pre-developed curriculum, the administrators respected the existing curricular materials already developed by teachers in the District in the areas of reading, mathematics and writing. The administrative team remained committed to teachers' past work and agreed only to modify the curricula and related materials.

To accomplish the modifications, teacher volunteers were employed beyond the school day. These teachers attended inservice workshops pertaining to cooperative learning and to the specific curricular adaptations necessary. Thus teachers were supported through time as well as monetary remuneration.

Staff Development

Providing teachers with the necessary training was essential to the project implementation. All of the teacher volunteers were provided with a general overview of cooperative learning as well as specific subject area training for experimental group teachers. Release time as well as monetary remuneration were provided.

The staff development training programs for experimental group teachers were conducted by researchers and staff development trainers from the Johns Hopkins University. Thus expert training was provided as an outgrowth of administrative commitment.

Follow-up Support

Follow-up support was provided for all teachers in the experimental group. Building principals, district coordinators and staff from The Johns Hopkins University established a schedule of classroom visitations. The Johns Hopkins staff members visited each class approximately once each month. In addition,

the two intermediate principals as well as the coordinators spoke with teachers and visited classrooms. Feedback to teachers was provided and concerns and questions were answered. Issues which could not be resolved immediately were followed up by meetings, phone calls and informal networking.

Additionally, the administration supported teachers by eliminating the formal teacher evaluation process for the duration of the project. For participating teachers in the experimental group, teacher evaluations were suspended for the project year. Eliminating the evaluations removed any fear on the part of experimental group teachers that risk-taking within the project might result in reprisal.

Staff Collaboration

Monthly meetings with participating teachers were scheduled. After-school meetings were seen as vehicles to obtain feedback from teachers and to keep lines of communication open. In addition, the meetings evolved into times when staff members shared common problems and often proposed solutions. These meetings were critical as vehicles for teachers to support one another and for teachers and administrators to dismiss role hierarchy and collaboratively solve common problems.

With administrative support, the need for and desire to have interclass visitations arose. Ultimately teachers in the experimental group began to observe one another using cooperative learning strategies with their students.

Teacher Feedback

Throughout the project the administration wished to identify teacher needs through structured feedback. Following every staff training meeting, the administrators asked teachers to provide them with written feedback. Several

structured questionnaires were developed. Through surveys, teachers provided their written reactions to identify problem areas and to suggest areas in which they could benefit from support. Following the feedback from the teachers, immediate follow-up by a principal or a district coordinator was provided.

Collaboration

Providing administrative support to teachers was based upon the following premise: that administrators and teachers should work together to solve problems, learn together, achieve together, respect differences and benefit from the wisdom of each other along the way. The leadership of building and central office administrators focused upon the collaborative effort of the entire project. Administrators supported teachers in that they shared leadership cooperatively with teachers as well as with the university researchers involved in the project. Clearly, the administrative support sustained through the entire research study was vital in the implementation of the entire project.

Measures, Data Collection and Data Analysis

As indicated earlier, student achievement, self-esteem, attitudes, gender and race relations were measured and compared for classes in the experimental and control groups. To measure mathematics and reading achievement, the Iowa Tests of Basic Skills were administered. For self-esteem, the Coopersmith Self-esteem Inventory was used. Another achievement measure, a writing sample, was administered to assess comparisons between the control and experimental groups. To determine attitudes toward boys and girls and students of diverse races, a friendship survey was administered prior to the treatment and then at the conclusion of the study. What follows is an overview of each test, survey

and measure used in data collection and analysis.

Iowa Tests of Basic Skills

To measure achievement in mathematics and reading, the Iowa Tests of Basic Skills (ITBS) were administered. Pre-testing was conducted during the spring prior to the study to all students in the third, fourth and fifth grades. The post-tests were administered in the spring at the conclusion of the study to the same set of students.

Included in the ITBS battery were the reading comprehension, mathematics and vocabulary sections. The three areas were used together for a combined achievement profile. Forms 7 and 8 included the multi-level booklet for levels 9-14. Third grade students received level 9, fourth graders received 10 and fifth grade youngsters took level 11. By the time the Iowa Tests of Basic Skills were administered as posttests, the cooperative learning treatment in reading had been implemented for three and one half months and the treatment in mathematics had been in place for six months.

In order to adjust for students' performance levels at the outset of the study, the standardized test scores were used as covariates in the analyses of achievement in mathematics and reading. In analyzing the data the consistent measure of achievement that was used reflected a combined measure of ability. The scores used as covariates were the pretests in total mathematics, reading and vocabulary skills from the Iowa Tests of Basic Skills.

The pretest scores were transformed into z- scores separately for third, fourth and fifth grades so that the data across grade levels could be collapsed. Again with the posttest scores, the raw scores from the three scales including mathematics, reading and vocabulary were transformed to

separate z- scores for each grade to facilitate combining scores among third, fourth and fifth grades.

Coopersmith Self-esteem Inventory

To compare the control and experimental groups relative to self-esteem, the Coopersmith Self-esteem Inventory was administered as a pre- and posttest. The Inventory is often used by researchers as well as educators to provide an initial baseline measure of self-esteem prior to implementing a program thought to enhance self-esteem in students.

Generally, the Coopersmith Self-esteem Inventory (CSEI) measures attitudes toward the self in social, academic and personal contexts. More specifically, the form of the CSEI used for school children contains five subscales: General Self, Social Self - Peers, Home - Parents, School - Academic, Total Self, and Lie scales. Used for classroom screening, clinical and research studies, individual diagnosis and pre-post evaluations, in this study the CSEI was used as the basis for pre- and post-test information relative to cooperative learning.

A paper and pencil instrument, the school form of the CSEI is used with youngsters ages 8 to 15. The CSEI contains questions such as "I often wish I were someone else" and "I can make up my mind without too much trouble" to which the student responds "Like Me" or "Unlike Me." Additionally, an adult form is available.

The Coopersmith Self-esteem Inventories are among the most widely used and best known measures of self-esteem (Johnson, Redfield, Miller, & Simpson, 1983). Brief, easily scored, reliable and stable, the inventories are grounded in a general theory of self-esteem and the relationship to academic

performance.

Writing Sample

For writing, a writing sample was administered immediately after the teacher training in November, prior to the implementation of cooperative learning strategies in writing in the classroom. For the writing sample pre-test, students were directed to complete their compositions using the guidelines of the fifth grade New York State Pupil Evaluation Program (PEP) Test. That is, students were permitted to do pre-writing, drafting, revising and their own editing. Ultimately a final draft was required.

The posttest writing sample was completed at the end of the study during the first two weeks in June. At that point, the treatment in writing for experimental group classes had been in place for six months.

For the pretest in writing as well as for the posttest, directions for students and teachers guided the students' responses. The teachers distributed the writing sample to students and explained the purpose: to assess the students' writing and compare the sample to students in the "other group," control or treatment. Students were asked to write about their "best friend of all time" and identify "one special time" spent together. The piece of writing focused upon a description of that friend and upon the incident that exemplified the unforgetable nature of the friendship. The pretest probe follows below.

PreTest Probe

> Who is your best friend of all time? Is that person still your best friend? Why did you pick that person for a best friend? What kinds of things did you do

together that were really special? Did you ever sleep over each other's houses? Have you shared things with that person that you wouldn't share with anyone else? Have you gone places together that you will always remember?

We want to put together a book about best friends for other children to read. Write about a particular experience that you had with your best friend that you would like to share. Pick one special time you spent together and tell what you did, where you were, and why this experience is one you will never forget. Be sure to give an exciting description so the readers of the book will enjoy reading about the fun you had with your best friend.

The posttest writing sample focused upon the students' favorite birthday. Students were asked to select their most memorable birthday, whether the highlight of the date included a party, an experience or a feeling. With this sample, students drew upon their own experience, detailed a day and described the importance of the chosen birthday. The posttest writing probe follows below:

Posttest Probe

You may remember a few of your favorite birthdays. What was your very favorite birthday? Did you have dinner with your family? Did you have a party with your friends? Did you play games? Did you receive a

favorite gift? What do you remember that made this birthday your favorite?

We want to put together a book of stories about great birthdays for elementary school children to read. Write a story about your favorite birthday. Tell about what happened that day and what it was that made it your favorite. Be sure to give an exciting description so that the readers of the book will enjoy reading about your birthday.

Both the pretests and posttests were scored by a team from the Johns Hopkins University. After a three-hour training session, raters judged writing samples. Two raters per writing sample conferred with one another after their individual scores were indicated. Differences were resolved and the agreed-upon scores provided the basis for the data. Interrater reliability was confirmed as part of the process.

The writing sample probes were scored using an analytic scoring procedure in order to assess mechanics skills separately from content. With respect to the content variables of organization and ideas, each sample was scored on a one to three point scale. With respect to mechanics skills, a single scale which combined syntax, usage, word choice, punctuation, capitalization and spelling was used. Since the process of scoring writing samples consumed great quantities of time, one in four samples were scored according to the alphabetical order of papers within classes.

Friendship Choices

With respect to attitudes, a questionnaire enabled students to identify

in-class friendships. At the outset of the study and again at the conclusion of the experiment, students were asked to "write down the names of your best friends in your class." Six lines were provided for students to list peers in the class. Teachers directed students not to confer with one another nor discuss names among classmates.

When collected, the list of each child's friends' names was identified by gender and race. Friendship choices were coded as "same-ethnic" or "cross-ethnic" and "same-gender" or "cross-gender." That is, a coding system indicated the number of students chosen who were the same race as the youngster, a different race, the same gender as the student or the opposite gender. Comparisons between pretest and posttest selections were drawn for both the treatment and control groups. This system enabled the examination of trends and the proportions of each type choice in the experimental and control group.

The probe which appeared as both pre- and posttest questioning follows:

Friendship probe

> Write down the names of your best friends in your class. Be sure to write down both their first and last names.
>
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> _____

Summary

Thus, achievement, attitudes, gender and race relations were compared for students in the experimental and control groups. Treatment effects were considered for the following: achievement in reading, mathematics and writing; self-esteem; and race and gender preferences. Comparisons were made based upon students' races, genders and ability levels. The method of statistical analysis was an analysis of covariance in which the posttest means were compared using the pretest scores as covariates.

Ultimately, the data were analyzed in two ways. First, analyses of covariance were conducted using the individual class as the unit of analysis. For the standardized posttests, the reading, vocabulary and mathematics scores served as covariates in all analyses. For the writing samples, the same scores were used as covariates in combination with the pretests for each respective posttest. Comparisons were made based upon students' races, genders and ability levels.

Data collection began in June of 1986 with pretest scores on the Iowa Tests of Basic Skills. The data collection concluded in the spring of 1987 with the posttests on the ITBS, a writing sample, the student friendship questionnaire and the Coopersmith Self-esteem Inventory. The data analysis was conducted during 1987 and 1988 with the assistance of a team at the Johns Hopkins University who entered data into a computer and scored writing samples as described above.

This section has presented an overview of the measures and data collection used in analyzing the results of the study. The standardized achievement tests in the Iowa Tests of Basic Skills, the Coopersmith Self-esteem Inventory,

writing samples, as well as student surveys were administered in order to analyze and assess the outcomes of the study.

The research findings which follow answer the research questions relative to student achievement, self-esteem and attitudes, relative to gender and race in the context of the control group classes and the cooperative learning classrooms.

FINDINGS

Academic Achievement:

Mathematics, Reading and Writing

As indicated, experimental group classes implemented cooperative learning strategies in mathematics, reading and writing. With mathematics, the cooperative learning techniques had been in place for a total of six months. With reading, cooperative learning strategies were used for three months. The treatment for cooperative learning in writing had been employed for five months.

Relative to achievement, no differences were revealed between control group and experimental group classes in either mathematics or reading. However, in writing, positive gains were evidenced in the cooperative learning classes.

In analyzing writing, the three pre-defined criteria included ideas, organization and mechanics. A statistically significant difference was found in the ideas component of writing within cooperative learning classes. However, statistically significant differences were not present on mechanics nor organization.

Academic Achievement:

Ethnicity and Race

Comparing students who were black, Hispanic and Anglo revealed positive gains for Hispanic students in the cooperative learning group in the study. Especially in writing, significant advances were achieved for Hispanic youngsters.

Attitudes Toward Academic Subjects

When asked about their attitudes toward their academic subjects, students responded in one of three ways: I like [it] a lot"; "I like [it] a little"; "I don't like [it]." From these responses, a three-point scale was used for which a score of three represented the student's favorite subject and a score of one figured as a student's least favorite subject. In cooperative learning classes, a positive attitude toward reading was evidenced.

In addition, students in treatment group classes perceived their abilities in reading as greater than their peers in control group classes. Students were asked to rate themselves as to their estimated abilities in each subject area. Youngsters responded: "I am really good at this"; I do all right at this"; I am not very good at this." Based upon this three-point scale, students in cooperative learning classes evaluated their own abilities in reading as significantly greater than control group counterparts. No statistically significant differences were revealed in attitudes toward any other academic subjects.

Gender:

Academic Achievement, Self-concept and Attitudes

The study reviewed findings pertaining to achievement in mathematics, reading and writing based upon gender. In addition, the research considered self-concept of boys compared to girls as well as males' and females' attitudes. Comparing the control group to the experimental group yielded no statistically significant differences.

Grade Levels:

Academic Achievement, Self-concept and Attitudes

The study compared results of third, fourth and fifth grade classes. Contrasting scores on the Iowa Tests of Basic Skills, the Coopersmith Self-esteem Inventory and several attitude measures yielded no significant differences between the experimental and control groups.

Ability Groups:

Academic Achievement, Self-concept and Attitudes

Based upon pretest scores on the Iowa Tests of Basic Skills, students were divided by thirds into upper, middle and lower achieving youngsters. Control group and experimental group classes were compared after the treatment using cooperative learning in mathematics, reading and writing. No differences were revealed between the two groups based upon ability group designations.

INTERPRETATION

In study after study, cooperative learning has been shown to be an effective educational strategy to increase students' achievement, enhance race and gender relations and improve youngsters' attitudes toward school. Summarizing the research, Slavin (1980) indicates that with respect to achievement, cooperative learning techniques produce at least the same level of achievement as other traditional methods, and more often yield results that exceed traditional strategies. Secondly, cooperative learning has a positive effect upon relationships among black, white and Mexican-American students. Evidence also suggests that students' self-esteem is enhanced through cooperative learning situations. Additionally, students' liking for school is reported higher in classes in which cooperative learning is implemented. Thus, in addition to improving achievement, Slavin (1983) notes that cooperative learning methods yield positive results in the areas of social and emotional outcomes such as race relations, self-esteem and acceptance of academically handicapped students who are mainstreamed. Additional reviews of the research have revealed similar findings in works by Sharan (1980), Slavin (1981), and Johnson and Johnson (1974).

Why is it that in this particular study, dramatic differences were not found between the experimental and control group classes? Several hypotheses emerge.

It is possible that introducing three separate and distinct treatments in cooperative learning within a seven month period may have overwhelmed teachers and students in the experimental group classes. New strategies for implementing cooperative learning in mathematics, reading and writing might

best be spread out over a longer duration than seven months in order to achieve results. Teachers' comfort level in learning, mastering and then implementing new instructional techniques would likely be increased during a more expansive time period.

Perhaps, too, the instructional program, and curricula already in place in the Bay Shore School District were working satisfactorily. With programs in mathematics, reading and writing which were only a few years old, it is possible that curriculum and instruction in these areas were still vital, exciting and effective. Thus, significant differences between experimental and control group classes did not emerge.

The positive gains which were found for Hispanic students need to be investigated further. So too is the case with students' improved attitudes toward reading. The improvement in youngsters' writing will be explored even after the study has concluded. Although not part of the original research design, plans for a longitudinal study of youngsters who had been in the cooperative learning classrooms will be developed. Determinations regarding sustained effects will be made as students' progress is charted.

In answering the original research questions, one must conclude with the following summary: When cooperative learning methods were implemented during a seven month period in mathematics, reading and writing, students' achievement improved in writing. Students' attitudes toward reading increased at the conclusion of the study. Among the various groups involved in the experimental study, Hispanic youngsters demonstrated gains in academic achievement. In all other areas, no statistically significant differences were revealed.

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